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IV. *Extract of a Letter from Mr. William Arderon, F. R. S. to Mr. Henry Baker, F. R. S. containing Observations on the Precipices or Cliffs on the North-East Sea-Coast of the County of Norfolk.*

Dear Sir, Norwich, Oct. 29, 1746.

Read Nov. 20.
1746.

SINCE my last, my leisure Hours have been chiefly employed in visiting and examining many Places where I had Reason to believe I might find some Things curious in the mineral or fossil Kingdom; and I have enjoyed an inexpressible Satisfaction, in observing the great Variety of Subjects that demanded my Attention, and made every Pit or Fracture of the Earth, every *Stratum* of Sand, or Bed of Clay, every Flint or Pebble, strive, as it were, with each other, in producing something to oblige and reward me for my Trouble.

I look back with much Regret on the many Opportunities for this Study which I have formerly lost: But, as good Fortune has placed me in a Country tolerably fertile in these Kinds of natural Productions, I hope, by my future Application, to make some Amends for my former Neglect, and send you the inclosed Observations, as an Earnest of what you may hereafter expect, from,

Dear Sir,

Your most humble Servant,

Wm. Arderon.

ON the 19th of *July* last, I had the Pleasure of seeing those stupendous and amazing Precipices which bound our North-East Sea-Coast; and rode some Miles betwixt them and the Sea. I can assure you, I was highly delighted with viewing them; and, as Sir *Richard Steele* says, by the Description of *Dover Cliffs*, Whoever looks upon these Precipices, and is not moved with Terror, must either have a very *good* Head, or a very *bad* one.

These dreadful Heights are equally dangerous to come nigh, above or below; as they are so frequently tumbling down, and as often wash'd away by the raging Billows: And altho' they are 20, 30, and in some Places 40 Yards and upwards in perpendicular Altitude, yet I am credibly informed the Sea has got of the Land at least 110 Yards in less than 20 Years Time for some Miles on this Coast.

The various *Strata*, which make up this long Chain of mountainous Cliffs, must be greatly entertaining to every one, who takes a Pleasure in looking into the many Changes, which the Earth undoubtedly has undergone since its first Creation.

Vegetable Mould, Oaz, Sands of various Kinds and Colours, Clays, Loams, Flints, Marles, Chalk, Pebbles, &c. are here to be seen at one View beautifully interspersed; and frequently the same kind many times repeated; as if at one time dry Land had been the Surface; then the Sea; after, morally Ground; then the Sea, and so on, till these Cliffs were raised to the Height we now find them.

What makes this come up almost to Demonstration, are the (a) Roots and Trunks of Trees, which are to be seen at low Water in several Places on this Coast near *Hasborough* and *Walket*.

With respect to the Tooth I sent you some time ago, I could trace nothing more out than what I have before informed you; but, that Bones of Animals are often found here is indisputably true; and I have now by me another (b) Tooth of an Elephant found betwixt *Munfley* and *Harborough*, which (c) I shall forbear to describe to you, as I design it to wait upon you with some other Fossils in a few Days.

That the rest of the Bones of these Animals are not preserved so commonly as the Teeth, I am informed is their prodigious Bulk and Weight; which are so great, that the Country People thereabouts have never thought it worth their while to save them from the Fury of the tempestuous Waves.

In

(a) Dr. *Hook*, in his posthumous Works says, the like are to be seen on the Coasts of *Cumberland* and *Pembrokeshire*.

(b) *Richard Verstegan* says, nigh *Bruxelles* in *Flanders* were found the Bones of an Elephant, the Head of which he had seen. *Verst.* p. 115.

(c) ' Only, that as this Tooth is much more decayed than that I before sent you, and hath several Pieces broken off it, yet it weighs 10 Pounds and a Quarter; and would have weighed as much or more than that which Mr. *Tentzelius* describes in the *Philosophical Transactions*, N^o 234. found near *Erfurt* in *Germany*. This, I think he says, was the biggest ever found in *Europe*.'

In perusing Dr. *Hook's* posthumous Works, p. 313. in his Discourse on Earthquakes, I there find, that Dr. *Thomas Brown* of this City presented the *Royal Society* with a petrify'd Bone, found at *Winterton*, a little Country Town on this Coast, in the Year 1666; but am far from being of (d) Dr. *Brown's* Opinion, to take them all for Bones of Sea Animals, much less of the Whale Kind, which are found here.

Amongst the many *Strata*, which I took notice of in these Cliffs, there is one of a dark-grey Colour, which sweats out a yellowsulphureous Matter: I take it to be that sort of Earth from which Vitriol is made; but this is of such a caustic Nature, that, it but a small Piece of it be held to the Tongue, in a Moment it causeth as sharp and excruciating a Pain, as if a red hot Iron had been holden to it.

(d) 'Whoever will take the Pleasure to read Mr. *Blair's* Description of the Skeleton of the Elephant, now at *Dundee* in *Scotland*, inserted in *Phil. Transf.* N°. 326, will find these Teeth before-mentioned to be the real Teeth of Elephants, whatever Dr. *Brown's* may be: And though I have never seen that Bone he presented to the *Society*, yet, I imagine it to be a Bone from the same kind of Animal.'

An Account of the Strata of Shells, and other Fossils, found at Cantley White House in Norfolk.

After giving you a short Account of what I thought worth my Notice on our North East Sea-Coast, I shall here lay before you what I have observed in some Marl-Pits at a Place called *Cantley White-House*, about three Miles from *Norwich*, almost South-East, and adjacent to the Country Seat of the honourable *Thomas Vere*, Esquire (e).

These Marl or rather Chalk-Pits are made in the Side of a long Chain of Hills, which runs along the Side of the River *Tar*, and about a Furlong or two now-and-then distant from it.

These Hills I take to have been formerly the Boundaries to an Arm of the Sea, which made *Norwich* a famous Sea-Port. This, Sir, some of our (f) antient Histories make mention of as an undoubted Truth, tho' now look'd upon as a mere Fable, as no Footsteps of it remain above-ground at this Day.

In the above-mention'd Marl-Pits I have lately discovered a (g) *Stratum* of Shells, of about two Feet thick,

(e) *Verstegan* says, that many Places which were Sea became dry Land, at the breaking of the *German* Ocean through the *Isthmus* which once join'd *England* to *France*. *Verst.* p. 117.

(f) The Reverend Mr. *Bloomfield*, in his History of *Norwich*, produceth several antient Writings, which assert the Truth of this. Page 2.

(g) The Reverend Mr. *Thomas Lawrence*, in his *Mercurius Centralis*, is of Opinion, these Shells, and all others under-ground, are lodged here by subterraneous Currents. Page 47.

thick, running nearly parallel to the Horizon, and I believe high level with many Parts of the Ground in *Norwich*. This, Sir, seems to put the Matter out of all Dispute, and fairly confirm our antient History (*b*).

I examin'd carefully this *Stratum*, where I found a great many (*i*) Kinds of Shells, but none which had withstood Time's all-devouring Teeth, so as to bear the handling; excepting the common Wilk, some of which were very perfect (*k*).

Amongst

(*b*) Dr. C. Leigh, in his natural History of *Lancashire*, foolishly enough, boldly affirms all Fossils to be the Disports or *Lusus Naturæ*. Book III. p. 41. and many other Places.

(*i*) Common Cockle. Black Mussel. Oyfter. *Pectunculus*, &c.

(*k*) The ever memorable Dr. Hook, in his posthumous Works, says, that Earthquakes seem to be the chief Efficients which have transported these petrified Bodies, Shells, Woods, &c. and left them in such Parts of the Earth as are no otherwise likely to have been the Places wherein such Substances should be produced.

' That several Mountains and Vallies have taken their Rise from Earthquakes must inevitably be allowed; but then they are to be found in hotter Countries than this. If the contrary is believed, why don't such Things happen now? And why is all History silent upon this Head? Besides, the Regularity of the *Strata's* of Shells, and their often lying parallel to the Horizon for many Yards, I own, puzzle me very much, and prevent me from acquiescing with this ingenious Man on this Head.'

' Dr. Woodward's Hypothesis, or Manner of bringing these Shells, and all other Fossils, into the Places where we now find them, by a total Dissolution of Matter, is indeed very pretty; but so many Difficulties arise (however plain it might appear to him) I believe few now-a-days are of his Opinion.

' Above all, I think Mr. Petit's Way of Thinking is liable to the fewest Objections; viz. by the Variation of the Parallelism of the Earth's *Axis*; which, being allow'd, must certainly alter the Centre of Gravity: If so, then all the fluid Parts will conform thereto; and then it will follow, that one Part will be cover'd, and overflow'd by the Sea, that was dry before, and another be discover'd and laid dry, that was before overwhelm'd.'

Amongst the Variety of Things I took notice of in this *Stratum* was a Piece of Coal; which I picked out from amongst the Shells. This must have lain here as long as they, and been brought from some other County, as nothing of its Kind is to be found here, but what is brought from distant Parts.

Certainly, Sir, this seems to prove, that the Use of Coals has been known to the antient *Britons*; and that they brought them hither from the more Northern Parts, when the Sea cover'd the greatest Part of *Norfolk*: Tho', in all Probability, this must have been some Thousands of Years ago.

These Shells lie 14 Yards above the Surface of the River, and nearly 6 beneath the Top of the Hill; and I believe 34 Yards above the Surface of the Sea at *Tarmouth*.

I have one Thing still to relate to you, which is really wonderful, and very much beyond my utmost Endeavours to find out a sufficient Reason for: it is, That in these very Marl-Pits, and I dare be bold to say, 6 or 7 Yards lower than the above-mention'd *Stratum* of Shells, are found an unaccountable Quantity of Stags Horns lying in all Directions: Several I took out with my own Hands; and the Workmen, which are employed here, tell me, that they scarce work a Day, but they find less or more of them.

But with my utmost Diligence I have not yet been able to find one whole and intire; nor do the Workmen say They ever did; which I take to be very strange.

These Horns (*l*) have been very large ones; some of the Spines measuring 12 Inches and upwards in Length. The Horns themselves, many of them, are better than $2\frac{1}{2}$ Inches in Diameter, and several of Stem above 12 Inches from Spine to Spine.

Another Curiosity I was informed of, which would have been a great Pleasure to me to have had it in my Power to have sent you : It was the entire Skeleton of a Man, which was found in the same Bed or *Stratum* with the above-mentioned Horns, as one of the Workmen assured me : He said, he took the Pains to lay it all together upon the Grass, as regularly as he was able ; but his Curiosity being then satisfied, he left it to be ground to Pieces by the Carts and Waggons that came thither for the Marl ; so careless were these poor ignorant People of so valuable a Specimen of the human Race ! What instructive Inferences might perhaps have been drawn from such a Skeleton, with respect to the Magnitude of Men in the early Ages of the World ! I own, I cannot but regret the Loss of it.

Helmet Stones (*m*) and *Belemnites* are here to be found in abundance, at all Depths, and in every different *Stratum* ; which I think shews, that the Fish, which produced these Fossils have been very plentiful : And so they must have been all over the County,
as

(*l*) ' The Nature of these Horns seems to the Eye to be intirely changed into that of Chalk, only retaining their outward Form, and the Poroseness of their inward Parts.'

(*m*) ' Whatever *Strata* here *Helmet Stones* are found in, I observe they are mostly fill'd with Matter of the same Nature and Consistency, provided they have lain there undisturbed.'

as the like are to be found in every Place where-ever the Earth is broken open, or a Pit is digged.

An Account of other Fossils, found near Hartford-Bridge in Norfolk.

ABOUT a Mile South of a little Country Town called *Kisick*, and near two Furlongs from (n) *Hartford-Bridge*, is a Pit, in which the Country People dig a particular Sort of Clay to lay upon their sandy Lands.

Amongst this Clay, Sir, lie a great many Knots, Lumps, or Nodules, of a bluer Sort of Earth, not widely differing from that which is found in *Harwich* Cliff: These, when digg'd up, are soft; but when they have been for some time exposed to the open Air, they become almost as hard as Flint.

In and upon these Lumps are the Impressions of the *Cornu Ammonis* or Snake-Stones in a beautiful Manner, from one Inch to five or six in Diameter; and several I saw with Part of the Shells upon them of a yellowish White (o).

Many other Shells are to be found in these Lumps, as the *Pectunculus*, Helmet-Stones, *Belemnites*, common Cockle, *Turbo's*, &c. but these are most of them very small.

But

(n) About three Miles South-West of *Norwich*.

(o) 'When this Clay was soft, I found it impossible to get one of them whole.'

But still more curious than all the rest are certain Lumps of petrified crystallized Matter, of a very odd Form, such as I have never seen or ever read of.

They appear to have been originally Lumps of blue Clay, cracked by some subterraneous Heat, or other unknown Cause, into which the Water has insinuated, and the Salts contained therein have crystallized in the Cracks.

When these Lumps are taken up, and become dry, the Clay Part falls from out the exterior Cells; and then they may be thought grossly to represent an Honey-Comb. At first I took them to be Bones from within-side the Skull of some great Fish, or other Sea Animal; but some which I have seen lately, and of which I shall send you a Specimen, have convinced me I was mistaken. Indeed since I wrote the above, I have compared this Fossil with the Description Dr. *Woodward* gives of the *Ludus Helmontii*, and I think it agrees somewhat therewith.